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ABSTRACT

The introduction of addition, subtraction, multiplication, and division to children is seen to require a compatible and sequential methodology. The sequence of learning is seen as: (1) physical action: (2) emotional involvement: and (3) conceptual learning. A learning sequence should involve the following steps: (1) connecting number experience to physical movement: (2) connecting number experience to feeling and learning: (3) connecting number experience to seeing: and (4) connecting number experience to thinking. The entire learning process is outlined, and is seen to lead children from the physical to the feeling, perceptual, and conceptual experiences of numbers. Children who have attained the conceptual stage are viewed as having acquired the true sense and meaning of numbers. Further, the learning process is promoted as an active, rather than passive, response, where motor activity not only plays a major role but serves as a transitional vehicle. (MP)

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TEACHING NUMBER CONCEPT TO CHILDREN

Earl J. Ogletree

Introduction of the four arithmetical processes of addition, subtraction, multiplication and division to children requires a compatible and sequential methodology. This approach is particularly applicable to teaching young children.

Prior to teaching the four processes, the child must develop a feeling for and concept of number. At the outset it is difficult to establish this feeling for number with an intellectual approach. The child must first experience number, than gain a feeling for it, which then becomes the basis for understanding it. The first grader is a "doing being." He conquers his environment through the movement of his limbs, while the adult does it through his intellect. The prototype of the young child is a being in dynamic movement and in active-physical interaction with his environment, playing with objects, touching and manipulating them, conquering space. The prototype of the adult may be Rodin's thinker, a scholar or a scientist in his laboratory. This difference suggests that at the primary level the teaching of arithmetic should be a dynamic-experiential approach.

The sequence of learning should be:

1. Physical action
2. Emotional involvement
3. Conceptual learning

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To teach number concept to young children, we must capitalize on their learning style. They follow a learning sequence that involves the following steps:

1. Connecting number experience to physical movement
2. Connecting number experience to feeling and learning.
3. Connecting number experience to seeing
4. Connecting number experience to thinking

The first step in this process is to have the children demonstrate their counting ability. Initially select those children to count who appear to have the least knowledge of numbers. This allows them to display their abilities without the threat of competition, which should be minimized. Positive self-concept is important and should be supported and enhanced with sincere praise. After the children have all displayed their counting ability, practice counting should begin.

Practice exercises in rhythmical counting should be used. Initially it should be done with the entire class or smaller groups. They can count backwards and forwards. The children can practice counting loudly, softly, slowly and quickly. This can be done in relation to a popular melody or poem known by or introduced to the class. As music and poetry have rhythmical qualities in terms of meter and time intervals, so does counting or numbering also have time intervals.

Poetry has syllables and time intervals. The following poem by Lisa Monges (New York Steiner School) is a good example:

We will work and
We will labor
Good to friends and

Good to neighbors

The counting exercise can become more physical by clapping and stepping, relating movement to learning through rhythm, thus engendering feelings and enhancing emotional involvement. For we all know it is easier to learn a poem or melody which has rhythm than the page of a textbook that lacks this quality. With young children this propensity for rhythmical and emotional learning is more prevalent than in adults.

Initially each syllable can be stressed, than every second syllable than every third one, and lastly every fourth syllable. The emphasis can be done by clapping or stepping or both stepping and clapping and/or by saying the accented syllable softly or loudly.

Variety enhances number experience. The verse or poem can be reviewed several days in a row, depending upon the needs and interest of the class. After several days of this kind of preparation, the verse and syllables are substituted with numbers; the children clap and step in the same rhythm by having them count:

1. Accent each number:

   1 2 3 4 5 6 7 8 9 10 11 12

2. Accent every other number:

   1 2 3 4 5 6 7 8 9 10 11 12

3. Accent every third number:

   1 2 3 4 5 6 7 8 9 10 11 12

4. Accent every fourth number:

   1 2 3 4 5 6 7 8 9 10 11 12

By means of emphasizing a second, third, etc. numbers, the foundation for multiplication can be developed. Counting while jumping rope is also an excellent activity for reinforcing number sense in children. Reinforce with forward and backward counting. With the coordination of physical movement, the sense for number becomes an integral part of his physical being because he has experienced it motorically. This has some logic. Perfection is in the forgetting of the process. We have acquired the ability to write because we have forgotten the process, which has sunken into the subconscious. Similarly, for young children the sense of number emerges as a ability because the experience of learning it has sunken into the subconscious.

At this stage children have developed the sense of number to the level of feeling, a general awareness. They have experienced number sequence, ordered sequence and rhythmic sequence. They have reinforced the experience of the relationship between thinking and movement and between thinking, feeling and hearing all in relation to number awareness.

The next step is to establish the relationship between children's mental activity and his general feeling for number in relation to seeing. The one to one correspondence between number and object needs to be established at this time. This can most easily be done by finger counting and toe counting, counting the number of people in the child's family and by counting the number of pupils in the class. Counting of objects should be done for reasons that make sense to children; it should have practical application. For example, counting pupils for the purpose of taking attendance, or the number of children to be seated at a table to determine if there are enough books for the class, etc. This establishes the principle of cardinality (how many).

The connection between sight and number concept can be reinforced by guessing

how many marbles there are in a jar. Then separating them out and determine the number of blue and yellow marbles. The basic principle is that children start out with a known number of objects, seperates them into several heaps or groups, one of which remains uncounted and has been determined by calculating the number of objects in the other piles. This approach gradually leads into addition and subtraction. This challenge gives the youngsters confidence. Also the concept of greater than and less than can be introduced here.

Counting "how many" establishes a one to one relationship between object and number, between seeing and number experience. A transition has to be made to establish number experience with thinking or number concept. The author suggests a method by which the teacher leads the children from counting how many to naming how many without counting. Instead of the children counting the objects, the teacher counts them silently while placing them on the table. A child is or children are asked to tell how many objects are on the table without counting. A variety of ways of naming the number of objects without counting can be used, such as how many numbers on a clock? How many wheels on a car? How many coins? Or how many books do you have?

To develop the principle of ordinal numbers (which one), the teacher can place a sequence of numbers 1-10 on the board.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, --

Ask the children which is the third number from the beginning, etc. After extensive practice, place a mixed number sequence on the board.

2, 1, 4, 5, 10, 3, 8, 9, 7, etc.

Ask the children to find the fourth number from the beginning, etc. This activity can be practiced finding ordinal numbers by locating the fourth child in the row; find the third row; find the fifth child in the second row

or find the sixth page in a book. Place numbers on the children's backs or desks, have them find numbers #6, #10, #11, etc., or have them tell the hour at which the small clock hand is pointing. locating ordinal numbers can also be reinforced by sequence counting by 2's, 3's, then 4's, etc., for example:

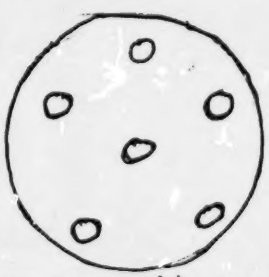
1 2 3 4 5 6 7 8 9 10 11 12

This also provides a brief introduction to multiplication.

Throughout the four step process the children learn and practice the writing of number symbols. They can walk or step the shapes of the numbers drawn large on the floor. They copy the symbols drawn on the board by the teacher in the note book using crayons. The teacher can also provide representative pictures or drawings for the numbers, which the children copy in their note books.

At the conceptual level, the naming of numbers, children can work with manipulatives and types of set theory problems in which children draw the set of objects to represent the number and calculates the number from the set of objects.

For Example:



= ___ or 7 =

The teacher has to provide a variety of practical learning experience to reinforce number concept.

This process of teaching number concept leads children from the physical to the feeling to the perceptual and to the conceptual experience of numbers.

When children have attained the conceptual stage, he has acquired the true sense and meaning of numbers.

The coordination of movement and thinking activities are particularly helpful for young children. It helps to develop an increase sense of body scheme, body control and coordination. The physical-rhythmical activities provide experiences compatible with their learning style and forms the foundation for conceptual thinking and increases retention. Studies have shown that learning for young children gained through motor activity is more rapidly acquired and more stably formed a learning acquired passively. Piaget has stated "Learning is possible only when there is active assimilation." The perception of meaning is incomplete without full manipulation and bodily movement. It is only when the learner himself is totally involved in the activity of learning that the experience can effectively influence and transform the learner.

The learning process should not be passive but an active response. Motor activity not only plays a major role in the learning process but also serves as a transitional vehicle for the development of higher mental functions.